Met Office

NEWS

New global dataset shines a light on humidity extremes

Author: Press Office
10:57 (UTC+1) on Mon 25 Sep 2023

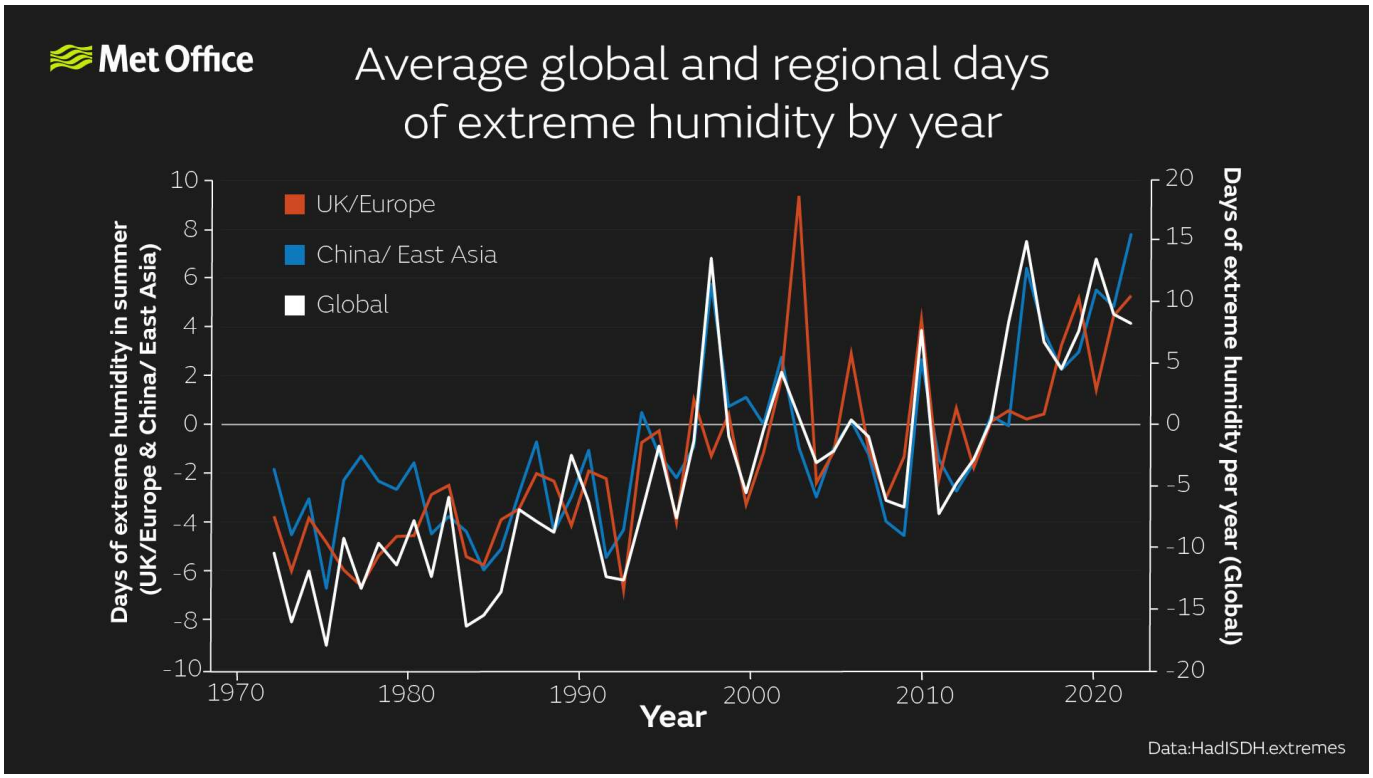
An innovative new dataset published by the Met Office highlights the importance of humidity on global heat extremes.

The new HadISDH.extremes dataset developed by Met Office scientists monitors both temperature and humidity across the globe over long periods of time. It provides a crucial insight into how combined heat and humidity events around the world are changing over time.

As the global temperature of our atmosphere rises, it can hold more moisture. As well as contributing to an increase in frequency and intensity of extreme rain events, this additional moisture held in the atmosphere can increase humidity. Humidity affects how easily the body can cool by sweating. In warm, humid conditions this is more difficult, increasing health risk to humans.

Analysis of the new data has shown that global annual / seasonal mean of maximum daily wet bulb temperature, a measure of humidity, has increased by around 0.2°C each decade between 1973-2022. This rate of change is even higher when looking at the summer months in the UK and Europe, with an increase of around 0.3°C each decade over the same period. Although a seemingly small figure over decades, the increase in severe humidity events can have an impact on human health and productivity.

Humidity can be defined in several different ways, but a common definition is the 'wet bulb temperature'. This is a measure of how saturated the air is and measured by using a thermometer covered in material saturated with water. Evaporation of the water has a cooling effect on the thermometer and can readily occur up to the point where the air becomes saturated – at which point the wet bulb temperature is then equal to the dry bulb temperature.



Stealth heat events

The data has also uncovered new ways of examining different types of heat event, for example ‘hot and dry’, ‘hot and humid’ or ‘warm and humid’. Each of these types of extreme heat have different characteristics and require different cooling methods to combat the effects of the type of heat. The new dataset allows users assess what sort of heat event different regions or seasons are mostly experiencing which will help with adaptation measures to cope with our changing climate.

For instance, there may be occasions where an extreme heat event might not be detectable from daytime maximum temperatures, yet significant impacts may result from high humidity. These events might not be flagged as dangerous but can still have impacts on how people feel and could lead to lower levels of productivity. The research terms these events ‘stealth heat events’.

Dr Kate Willett, Expert Climate Monitoring Scientist at the Met Office, said: “We know that our atmosphere is warming, and that temperature extremes are increasing in frequency and magnitude, and there are well established datasets that have tracked these changes over a long period of time. That hasn’t previously been true for humid heat extremes, this new dataset aims to fill that gap by providing a global, long term dataset for humid heat extremes.

“Humidity is a critical meteorological factor to track, as it has a profound impact on human and animal health and productivity. A wet bulb temperature of 35°C is a threshold where the human body can no longer cool itself through evaporation of sweat. What we can see from this new dataset is that humidity is increasing across the globe but at faster rates in particular regions and during different seasons. Continued increases in humidity as our climate warms will see increasing extreme events where heat stress becomes a hazard, and even areas of the world which are no longer habitable for humans.”

Dangers of extreme humidity

It is well known that extreme heat can cause significant issues for infrastructure and human health, and that these extremes are becoming more frequent and intense because of climate change. The importance of humidity and how it is changing over time is less commonly considered despite being of paramount importance to human health.

Although our skin temperature can vary quite a lot, on average it is between 33°C and 37°C. Generally, the wet bulb temperature is below this level, so water (sweat) can be readily evaporated away from the skin, leaving the skin cooler as a result, just like the wet bulb thermometer. However, if the wet bulb temperature reaches a similar level to skin temperature the body’s ability to cool itself through evaporation is significantly reduced. It is for this reason that atmospheric conditions where the wet bulb temperature of 35°C or above are considered uninhabitable for humans.

The methodology behind the HadISDH.extremes dataset has been published in the journal Advances in Atmospheric Sciences accompanied with an analysis of humid heat extremes using the newly available data. The data is available to download from the CEDA archive.

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